

The Mineral County Challenge

Public Policy Implications of a Pyrolysis Business Model for Montana with Tricon Timber in Mineral County, Montana

January, 2010

By SuzAnne Miller, Dunrovin Research

Executive Summary

In April of 2009, the Mineral County Challenge brought scientists and managers from the US Forest Service, Mineral County officials, businessmen from Tricon Timber, LLC in St. Regis, Montana, and representatives from the nonprofit organizations of Sustainable Obtainable Solutions and the National Wildlife Federation together to discuss the potential of using the wood chips resulting from Tricon's manufacturing facility to produce biochar. The more the group learned about the science and the commercial application of the pyrolysis process involved in creating biochar, the more potential they saw, not only for Mineral County, but for all of western Montana.

Developing a pyrolysis capability in western Montana holds great promise for addressing important forest management, rural economic development, and global warming issues. Montana's forests are currently in an unhealthy state as a result of changing climate conditions and past forest management practices. Healthy forests are resilient, provide vital ecological services, and represent significant economic opportunities whereas unhealthy forests are vulnerable to the risk of large scale intense fires with subsequent environmental and economic damage. Western Montana's environmental and economic health rests in large part on its ability to prudently address the issue of forest health.

Returning Montana's forest to health will be complex and expensive process. The goal to return forest conditions to those most consistent with natural ecosystems requires consideration of all aspects of forest ecosystems – the soils, the hydrological cycles, animal and plant growth and diversity, and fire. Removal of the woody biomass that has accumulated in the forests is a critical part of that process and can be accomplished through fire, mechanical means, or a combination. Mechanical removal requires the skills and infrastructure of the timber industry, yet will produce large quantities of woody biomass that may be unsuitable for traditional wood products.

A commercial market for the woody biomass resulting from forest restoration is critical to keeping the timber industry viable and available for forest restoration and in offsetting the cost of the restoration itself; yet Montana's timber industry and associated rural communities currently face extreme economic stress. Montana cannot afford to restore its forests on the scale needed if its timber industry does not survive.

The pyrolysis process of turning woody biomass into biochar and syngas offers a solid solution to many of these issues. This document outlines in greater detail the pyrolysis process, the commercial potential, the relevant public policy issues, and provides a check list of ways in which the business model put forward by the partnership between Tricon Timber and Glacier Clean Technology addresses those policy issues.

The Mineral County Challenge

Positioning for Prosperity in a Changing West

Background Information – What is Pyrolysis?

Pyrolysis is a form of incineration that chemically decomposes organic materials (biomass) by heat in the absence of oxygen. Pyrolysis typically occurs under pressure and at operating temperatures above 430 °C (800 °F). Organic materials of almost any kind (from animal manure to wood waste) are transformed into small quantities of liquid, a combustible synthesis gas (syngas) gases, and a solid residue that contains carbon and ash (biochar). Syngas can be used as a natural gas replacement for heating or to generate electricity; and biochar can be used as a carbon soil amendment, as a pelletized fuel, or it can be activated to be used as a carbon filtration media. Biochar is recalcitrant against decomposition and can permanently increase the carbon retaining capacity of soils to which it is amended.

The simplicity of the process lends itself to a wide range of viable scales – pyrolysis can take place in a back yard burring barrel, in mobile units that travel from location to location, or in a large industrial complex. Pyrolysis operations are scalable and can be modular and portable; thus allowing low cost initial investment with unlimited growth potential.

Pyrolysis' simplicity, scalability, and low startup costs, ability to utilize a wider range of feedstocks, ability to produce outputs of high commercial and environmental value, and carbon sequestration capabilities have all attracted the attention of scientists, entrepreneurs, environmentalists, and governments across the globe. Since the quantity and quality of the products of pyrolysis are a function of the feedstock and operating temperature, research is underway in numerous countries to maximize the process to accommodate local biomass availability and to produce the desired outputs.

Background Information – What is the Mineral County Challenge?

The Mineral County Challenge is an active planning and collaboration process for creating a handful of economic development strategies selected by local stakeholders, evaluated by researchers, and supported by natural resource managers. With funding from the Economic Development Administration of the US Department of Commerce, Mineral County, and Montana State University and with in kind support and work from the Montana Department of Fish, Wildlife, and Parks, the US Forest Service, and numerous county volunteers, the Mineral County Challenge has worked to identify specific commercial opportunities that address both the economic needs and the environmental needs of the county. In April of 2009, the ***Mineral County Challenge*** brought representatives from Tricon Timber, a timber mill in St. Regis, Montana, together with researchers from the US Forest Service's Rocky Mountain Research Station to review the potential for developing a pyrolysis capability at Tricon to increase its economic viability and to address issues related to forest health in Mineral County. The more the group learned about pyrolysis from both economic and environmental perspectives, the more viability the group saw in it for addressing not only Mineral County's needs but those of rural western forest communities across the country.

The Mineral County Challenge

Positioning for Prosperity in a Changing West

Bringing Pyrolysis Capabilities to Mineral County Model for Montana

Tricon Timber, LLC is currently pursuing the development of a pyrolysis capability through several channels:

- In November, 2009, Tricon met with the staff of Senator Jon Tester to express support for “Water Efficiency via Carbon Harvesting and Restoration (WECHAR) Act of 2009” introduced into the US Senate by Senators Reid, Baucus, Hatch, Tester, and Udall which would establish loan guarantee programs to develop biochar technology using excess plant biomass and to establish biochar demonstration projects on public land, and for other purposes.
- In November, 2009, Tricon submitted an application for a USDA Woody Biomass Utilization Grant to purchase and install an experimental pyrolysis unit for testing output quality from biomass feedstock generated from western Montana forest restoration activities.
- In January, 2010, the Rocky Mountain Research Station in partnership with Tricon submitted a project proposal for federal economic stimulus money entitled: *A Process for Utilizing Forest Treatment and Mill Residues*.
- In December, 2009, Tricon began forming a business partnership with Glacier Clean Technology to develop and secure funding for a business plan to establish a pyrolysis plant at Tricon that would utilize woody biomass to produce biochar for activated charcoal and methane gas for electrical generation. Glacier Clean Technology of Kalispell, Montana, has a joint venture agreement with Bio Energy Conversion Global, Inc. to handle the manufacturing and implementation of TEA Process™ System in Montana, Idaho, Washington, North Dakota and South Dakota. The TEA Process™ System holds exclusive license rights for all fields of use for the TEA Process™ pyrolysis technology from Tucker Engineering Associates, Inc.

Pyrolysis Business Model for Montana

While the two grant proposals that Tricon has submitted for federal funding to develop pyrolysis capability represent a major step forward in answering many of the research questions associated with pyrolysis, the business plan with Glacier Clean Technology represents a far reaching opportunity for western Montana with significant public policy implications. Glacier Clean Technology envisions using their partnership with Tricon as a template to introduce the technology to other saw mills across the state, partner with a Montana manufacturer to build the units, and develop a networked capacity to process biomass waste from timber production and forest restoration, produce biochar outputs, and use methane for generating electricity. The public policy advantages of such a vision – referred to in this document as the **Pyrolysis Business Model for Montana** - encompass important environmental and economic issues facing Montana.

The Mineral County Challenge

Positioning for Prosperity in a Changing West

Public Policy Concerns

To appreciate the full extent of the public policy implications of the business model, it is necessary to understand the connection between four factors critical to western Montana's economic and environmental health: the health of western Montana's forests, the economic viability of Montana's timber industry, the economic health of associated rural communities, and environmental implications of global warming.

Health of Montana's Forests – Partly as a result of policies to suppress wildfire and partly as a result of decreased timber harvest over the last couple of decades, forests in Montana and much of the Western U.S. are denser with more woody biomass than they have been in the past. The increased density, coupled with persistent drought conditions has stressed trees and left them in a weakened condition. Disease outbreaks and insect infestation have killed large areas of pine forests and left dead standing timber only to become increasingly dry. Large quantities of dead, dying, weakened and dry timber results in forests at ever-increasing risk of wildfire.

Climatic data suggest a foreseeable future of warmer temperatures, more variable precipitation, reduced snowpack, and more frequent and potentially more severe storms. This will only exacerbate unhealthy forest conditions. Left unchecked, forests will burn. The question is not whether, but when, and how intensely. Intense forest fires can cause long term ecological damage to forest soils' water holding capacity and biotic environment essential for forest renewal subsequent to burning and protection of watershed environmental services such as clean water. Large, intense fires will endanger Montana's communities and infrastructures, alter Montana's natural landscapes, adversely impact fish and wildlife populations, fill Montana's skies with smoke, contribute to global warming through the release of carbon dioxide into the atmosphere, and significantly impact Montana's economy.

Options available to reduce the risk of wildfire are few and complex. Fuels can be reduced by burning, mechanical means, or a combination of the two. Burning can be done with controlled burns or by combining controlled burning with containing (rather than suppressing) naturally occurring wildfires. Fire as a management tool has inherent risks and can only be used under certain, suitable weather conditions. Furthermore, fire removes timber and residues from potential productive uses. On the other hand, fire is a natural part of Montana's western forest ecosystems and can renew the forest in many beneficial ways. Mechanical removal of woody biomass is generally more expensive than controlled burning, can adversely impact forest soils through soil compaction associated with large equipment, and may require additional roads which may be detrimental to wildlife and invite weeds. However, properly done it is far less risky to humans and wildlife, avoids long term ecological damage to soils and watershed associated with intense fires, does not release carbon into the atmosphere through smoke, and can bring economic benefits to forest communities. Using a combination of mechanical fuels reduction with controlled, low intensity fires may a better solution. Montana's forests, fish and wildlife populations, forest communities, and economy will all look very different depending on whether forest fuels are removed by fire, mechanical means, or a combination treatment.

Viability of Montana's Timber Industry – The soft wood coming from Montana's forests have traditionally been used to manufacture home construction materials, pulp, and paper. Montana's once thriving timber industry has seen significant declines over the past two decades. In 1995 over 30 saw mills were in operation in Montana; today there are less than 10. The reasons for the industry's decline

The Mineral County Challenge

Positioning for Prosperity in a Changing West

are complex and many – from increased international competition, to reduced raw material availability, to increased transportation costs, to changes in consumer demand. There are reasons to question whether Montana’s soft wood timber industry can long survive the many economic forces working against its interests.

The survival of Montana’s timber industry depends on two key basic economic factors - the same two factors that dictate the survival of any industry; that is, relatively stable supply and demand. Diversifying Montana’s timber industry to include pyrolysis addresses both of these critical factors. Logging associated with forest restoration can generate a steady supply of woody biomass that is suitable for pyrolysis but may not be suitable for traditional soft wood products; and demand for the syngas and biochar output from pyrolysis is increasing, not decreasing. Furthermore commercial markets for the products of forest restoration lowers the cost of mechanical means for removing forest fuels, and thus makes it economically feasible to treat the vast amounts of forest lands needing restoration. If the timber industry disappears from Montana, as it has in other western states such as Arizona, the cost of forest health restoration by mechanical means would be prohibitive. Montana’s ability to restore its forest health and to keep its timber industry alive are integrally intertwined.

Economic Health of Montana’s Rural Forest Communities – The decline of the timber industry has had a devastating impact on many of Montana’s rural forest communities. The wood products workforce has declined from a high of 13,500 in 1979 to its current level of less than 9,000. Rural communities wholly dependent on timber industry jobs have seen their populations plummet with each mill closing and have been left struggling to find alternative sources of economic activity.

Forest restoration jobs and associated economic activity can be very important to revitalizing rural forest communities. Jobs result from both the removal of woody biomass and from processing the materials into economic products. Furthermore, forest restoration jobs rely on similar workforce skill requirements to those of traditional wood products jobs and can commonly recruit from the local existing underemployed workforce.

Global Warming – Montana, and western Montana in particular, plays a critical role in the ability of the United State to cope with climate changes brought about by global warming. As the major source of water for both the Columbia and Missouri river drainages, Montana’s forests are key to water quantity and quality over much of the western half of the country. Similarly, Montana’s forests can either be a major contributor to atmospheric buildup of carbon dioxide through burning, or they can be a major source of carbon sequestration. Healthy, vigorously growing forests have the great ability to sequester significant amounts of carbon.

Different forest management treatments change the extent and intensity of fire which directly affects the balance between the amount of carbon released or sequestered. Woody biomass that burns or decays on the forest floor emit carbon, while carbon stored in manufactured wood products may be sequestered for many years and, in the case of biochar, for up to thousands of years. The length of sequestration depends of numerous factors, and one must also take into account the carbon emissions produced during manufacturing, including associated activities such as transportation of both inputs and outputs. Exact calculations are extremely difficult as they depend on many factors. The net impact of activities on atmospheric carbon will become an increasing important aspect of forest management and may best be considered in relative terms in choosing among alternative activities.

The Mineral County Challenge

Positioning for Prosperity in a Changing West

Public Policy Implications of the Pyrolysis Business Model for Montana

Each of the above factors is positively addressed by the **Pyrolysis Business Model for Montana**:

Health of Montana's Forests

- ✓ It provides a viable commercial market for woody biomass resulting from forest restoration and reduces forest restoration costs.
- ✓ Biochar output has potential as a forest or agricultural soil amendment for water and nutrient retention (currently under research by the Rocky Mountain Research Station).
- ✓ Plants can be easily scaled and moved to meet availability of feedstock supplies.

Viability of Montana's Timber Industry

- ✓ Pyrolysis produces multiple outputs and, therefore, multiple potential revenue streams.
- ✓ Market for outputs is increasing and independent of soft wood market.
- ✓ Process can easily be altered to meet demand for different mixes of outputs – biochar, activated charcoal, and methane gas for electric generation.
- ✓ The relatively low cost of individual plants and the use existing timber industry infrastructure puts the process within financial reach of small rural companies.
- ✓ Plants are scalable and adaptive; units can be resold and moved as supply and demand dictate.
- ✓ Plants are independent of prices set by a single supplier or buyer giving greater economic autonomy to each operation.
- ✓ Plants would be located near feedstock thus reducing transportation cost.
- ✓ Plants profitable in today's market on basis of producing activated charcoal only.
- ✓ Electrical generation can be delivered at or near currently electricity rates.
- ✓ The process can utilize a wide variety of feedstock and not dependent on a single source such a woody biomass.

Economic Health of Montana's Rural Forest Communities

- ✓ Plants located in rural communities with a timber industry history.
- ✓ Each plant would create up to 40 direct jobs.
- ✓ Required job skills consistent with other timber industry workforce skill requirements.
- ✓ Support jobs (trucking, logging, etc.) all within local area of each plant.
- ✓ Diversity of outputs increases communities' economic stability and resilience.

Global Warming

- ✓ Units would be located near feedstock thus reducing transportation carbon footprint.
- ✓ The process is self sustaining using 15% - 30% of resultant methane gas.
- ✓ The only carbon emitting component of the process is from the fuel used to initiate the self contained process.
- ✓ Biochar amended to soils sequesters carbon for hundreds to thousands of years.
- ✓ Units can utilize any organic material.

The Mineral County Challenge

Positioning for Prosperity in a Changing West

The Mineral County Challenge

Positioning for Prosperity in a Changing West

Additional Implications

- ✓ Units would be manufactured at a central site in Montana (Bozeman); thus creating additional jobs and positioning Montana as an industry leader.
- ✓ Dispersed electrical generation increases system resilience and decreases vulnerability.
- ✓ Contributes to national emphasis on energy independence, rural economic development, and creation of “green” technology and jobs
- ✓ The close working association between Tricon Timber, Glacier Clean Technology, the US Forest Service Rocky Mountain Research Station, and the University of Montana will maximize the research potential associated with the process and its outputs.

Contacts

- Angelo Ververis, Tricon Timber, LLC, St. Regis, MT; aververis@blackfoot.net
- Charlie Sales, Tricon Timber, LLC, St. Regis, MT; mbfsells@aol.com
- Craig Wilkins, Glacier Clean Technology, Kalispell, MT; Craig.Wilkins@zincairinc.com
- Greg Jones, USDS Forest Service, Rocky Mountain Research Station, Forest Sciences Labatory, Missoula, MT; jgjones@fs.fed.us
- Dan McCollum, USDS Forest Service, Rocky Mountain Research Station, Fort Collins, CO; dmccollum@fs.fed.us
- SuzAnne Miller, Mineral County Challenge, Dunrovin Research, Lolo, MT; dunrovin@bigsky.net